

1. (Amended) A method for processing frames of streaming data through modules in a digital computer, comprising:

constructing a graph as a sequence of the modules for accepting and processing the frames of streaming data to achieve desired output data;

dividing the graph to define a pipe according to performance parameters for each of the modules and the graph as a whole, wherein the pipe is a connected group of multiple ones of the modules, at least one of the modules being a restructuring module;

providing a common memory area accessible to the modules within the pipe for storing streaming data;

allocating composite frames in the common memory area, each composite frame having predefined subframes;

transporting the streaming data through different ones of the modules in the group in different ones of the subframes; and

restructuring the data among at least some of the subframes in the restructuring module.

2. (Amended) A computer-readable medium having computer executable instructions for a digital computer to perform steps comprising the method of claim 1.

3. (Amended) The method of claim 1 where the composite frame is a physical frame in the common memory area.

4. (Amended) The method of claim 3, where the subframes are virtual frames defined in the common memory area.

6. (Amended) The method of claim 5 where the allocator is assigned to a farthest upstream restructuring module in the pipe.

7. (Amended) The method of claim 5 where the allocator is assigned to a farthest downstream restructuring module in the pipe.

11. (Amended) A method for processing frames of streaming data through multiple modules disposed in a pipe in a digital computer, comprising:

constructing a graph as a sequence of the modules for accepting and processing the frames of streaming data to achieve desired output data;

dividing the graph to define the pipe according to performance parameters for each of the modules and the graph as a whole, wherein the pipe is a connected group of multiple ones of the modules, at least one of the modules being a restructuring module;

allocating a composite frame having multiple subframes;

performing operations upon the subframes in any of the modules sourcing data to the restructuring module;

after completion of the operations for all of the subframes sourcing data to the restructuring module, issuing a control transaction to the restructuring module; and

performing operations upon the subframes sourced to the restructuring module in response to the control transaction.

12. (Amended) A computer readable medium having computer executable instructions for a digital computer to perform steps comprising the method of claim 11.

13. (Amended) The method of claim 11 where allocating the composite frame includes constructing a frame control table having an entry for each module in the pipe and a flag for each of the modules indicating whether a particular module has completed an operation upon the subframe.

14. (Amended) The method of claim 13 further comprising setting one of the flags whenever a module has completed an operation upon a subframe.

19. (Amended) The method of claim 11, wherein the pipe accommodates performance of operations upon a plurality of composite frames concurrently.

21. (Amended) A method for processing frames of streaming data through modules including multiple restructuring modules in a digital computer, comprising:

constructing a graph as a sequence of the modules for accepting and processing the frames of streaming data to achieve desired output data;

dividing the graph to define a pipe according to performance parameters for each of the modules and the graph as a whole, wherein each pipe is a connected group of multiple ones of the modules including the restructuring modules;

assigning a single allocator to one of the modules;

allocating composite frames having predefined subframes associated with respective ones of the restructuring modules;

transporting the streaming data through different ones of the modules in the group in different ones of the subframes; and
restructuring the data among the subframes in the restructuring modules.

22. (Amended) A computer readable medium having computer executable instructions for a digital computer to perform steps comprising the method of claim 21.

33. (Amended) A method for processing frames of streaming data through modules including multiple restructuring modules connected in a pipe in a digital computer, comprising:
constructing a graph as a sequence of the modules for accepting and processing the frames of streaming data to achieve desired output data;
dividing the graph to define the pipe according to performance parameters for each of the modules and the graph as a whole, wherein the pipe is a connected group of multiple ones of the modules;
allocating a composite frame having multiple subframes for different ones of the restructuring modules;
performing data-sourcing operations upon certain of the subframes in source ones of the modules;
when each of the data-sourcing operations has completed, determining whether one of the restructuring modules has all of the subframes required for it to perform an operation;
if so, issuing a control transaction to the one restructuring module; and
performing an operation in the one restructuring module after receiving a control transaction.

34. (Amended) A computer readable medium having computer executable instructions for a digital computer to perform steps comprising the method of claim 33.

39. (Amended) The method of claim 33 further comprising:
storing a separate completion flag for each of the modules in the pipe; and
setting one of the completion flags when a corresponding one of the modules has completed an operation upon a subframe.

41. (Amended) The method of claim 33, wherein the pipe accommodates performance of operations upon a plurality of composite frames concurrently.

43. (Amended) A computer-readable medium having stored thereon a data structure for processing modules in a graph, comprising:

a single composite frame physically allocated in a memory; and
a plurality of virtual subframes allocated within the composite frame.

43/57. (Amended) A computer system for processing streaming data, comprising:
a plurality of modules for processing the streaming data, at least some of which are restructuring;

a plurality of memory managers for allocating composite frames containing subframes for containing streaming data; and

a flow manager for constructing a graph as a sequence of the modules for accepting and processing the streaming data to achieve desired output data, for dividing the graph to define a pipe according to performance parameters for each of the modules and the graph as a whole, wherein the pipe is a connected group of multiple ones of the modules, including a plurality of the restructuring modules, and for assigning one of the memory managers to the pipe.

43/58. (Amended) The system of claim 57 further comprising a common memory area for storing the composite frames.

44/59. (Amended) The system of claim 58 where the subframes are allocated within the composite frames in the common memory area.

53/68. (Amended) The system of claim 57 where the control manager issues a control transaction to one of the restructuring modules for initiating processing of a subframe therein only when all of the subframes processed by that module become available.

54/69. (Amended) A computer system for processing streaming data, comprising:
a plurality of modules for processing the streaming data, at least some of the modules being restructuring;
a plurality of memory managers for allocating composite frames containing subframes for containing streaming data, different ones of the subframes being associated with different ones of the modules;

a flow manager for constructing a graph as a sequence of the modules for accepting and processing the streaming data to achieve desired output data, for dividing the graph to define a pipe according to performance parameters for each of the modules and the graph as a whole,

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wherein the pipe is a connected group of multiple ones of the modules, including a plurality of the restructuring modules, and for assigning one of the memory managers to the pipe; and
a control manager for issuing control transactions for initiating processing operations in the modules.

all 67/71. (Amended) The system of claim 69 further comprising a common memory area for storing the composite frames.

67 78. (Amended) The system of claim 77 where a processor implements one or more of the restructuring modules.

67 80. (Amended) A computer readable medium bearing instructions and data for causing a digital computer to execute a method for processing frames of streaming data through modules in a digital computer, the method comprising:

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constructing a graph as a sequence of the modules for accepting and processing the frames of streaming data to achieve desired output data;

dividing the graph to define a pipe according to performance parameters for each of the modules and the graph as a whole, wherein the pipe is a connected group of multiple ones of the modules, at least one of the modules being restructuring;

providing a common memory area accessible to the modules within the pipe for storing streaming data;

allocating composite frames in the common memory area, each composite frame having predefined subframes;

transporting the streaming data through different ones of the modules in the group in different ones of the subframes; and

restructuring the data among at least some of the subframes in the restructuring module.

67 81. (Amended) A computer readable medium bearing instructions and data for causing a digital computer to execute a method for processing frames of streaming data through multiple modules disposed in a pipe in a digital computer, the method comprising:

constructing a graph as a sequence of the modules for accepting and processing the frames of streaming data to achieve desired output data;

dividing the graph to define the pipe according to performance parameters for each of the modules and the graph as a whole, wherein the pipe is a connected group of multiple ones of the modules, at least one of the modules being a restructuring module;

allocating a composite frame having multiple subframes;